

Hoey / Moey

- #2 a) molecular mass of $\text{NH}_3 = 14.01 + 3(1.01) = 17.04 \text{ u}$
b) " " of $\text{CH}_4 = 12.01 + 4(1.01) = 16.05 \text{ u}$
c) formula mass of $\text{NaHCO}_3 = 22.99 + 1.01 + 12.01 + 3(16.00) = 84.01 \text{ u}$
d) molecular mass of $\text{CH}_3\text{COCOCH}_3 = 4(12.01) + 6(1.01) + 2(16.00) = 86.10 \text{ u}$
e) " " of $\text{C}_{12}\text{H}_{22}\text{O}_{11} = 12(12.01) + 22(1.01) + 11(16.00) = 342.34 \text{ u}$

#3 (a) $\eta = 0.638$
 $m = ?$
 $\text{MM}_{\text{Ba}(\text{NO}_3)_2} = 189.37 \text{ g/mol.}$

$$\eta = \eta \times \text{mm}$$
$$= 0.638 \times 189.37$$
$$= 120.8 \text{ g}$$

(b) $m = 50.4 \text{ g}$
 $\eta = ?$
 $\text{MM}_{\text{CaBr}_2} = 199.88 \text{ g/mol}$

$$\eta = m / \text{mm}$$
$$= 50.4 / 199.88$$
$$= 0.252 \text{ moles}$$

(c) $\eta = 1.26$
 $m = ?$
 $\text{MM of NbI}_5 = 727.41 \text{ g/mol}$

$$\eta = \eta \times \text{mm}$$
$$= 1.26 \times 727.41$$
$$= 916.5 \text{ g}$$

(d) $m = 86.2 \text{ g}$
 $\eta = ?$
 $\text{MM}_{\text{C}_2\text{H}_4} = 28.06 \text{ g/mol}$

$$\eta = m / \text{mm}$$
$$= \frac{86.2}{28.06}$$
$$= 3.07 \text{ moles}$$

#4 a) $\eta = 0.943 \text{ mol}$

#molecules = ?

$Av \# = 6.02 \times 10^{23}$

#molecules = $\eta \times Av \#$

$= 0.943 \times 6.02 \times 10^{23}$

$= 5.68 \times 10^{23}$

b) #formula units = 7.74×10^{26}

$\eta = ?$

$Av \# = 6.02 \times 10^{23}$

$\eta = \frac{\# \text{ f. units}}{Av \#}$

$= \frac{7.74 \times 10^{26}}{6.02 \times 10^{23}}$

$= 1285.7 \text{ moles}$

c) mass = 91.9 g } 2 steps!
#form. units = ?

$MM_{NH_4IO_3} = 192.95 \text{ g/mol}$

$\eta = m/MM$

$= 91.9 / 192.95$

$= 0.476$

#f. units = $\eta \times Av \#$

$= 0.476 \times 6.02 \times 10^{23}$

$= 2.87 \times 10^{23}$

d) #molecules = 6.63×10^{23}

$\eta = ?$

$\eta = \# \text{ molecules} / Av \#$

$= 6.63 \times 10^{23} / 6.02 \times 10^{23}$

$= 1.10$

#5 a) $m = 25g$

$$MM = 17.04 \text{ g/mol}$$

$$\eta = ?$$

$$\eta = m/MM$$

$$= 25/17.04$$

$$= 1.47$$

b) $m = 25g$

$$MM = 16.05 \text{ g/mol}$$

$$\eta = ?$$

$$\eta = m/MM$$

$$= 25/16.05$$

$$= 1.56$$

c) $m = 25g$

$$MM = 84.01 \text{ g/mol}$$

$$\eta = ?$$

$$\eta = m/MM$$

$$= 25/84.01$$

$$= 0.298$$

d) $m = 25g$

$$MM = 86.01 \text{ g/mol}$$

$$\eta = ?$$

$$\eta = m/MM$$

$$= 25/86.01$$

$$= 0.291$$

e) $m = 25g$

$$MM = 342.34 \text{ g/mol}$$

$$\eta = ?$$

$$\eta = m/MM$$

$$= 25/342.34$$

$$= 0.0730$$

#6 a) $\eta = ?$

$\eta = 10$

$\text{MM}_{\text{BaCl}_2} = 208.23 \text{ g/mol}$

$\eta = \eta \times \text{MM}$

$= 10 \times 208.23$

$= 2082.3 \text{ g}$

b) # form. units = ?

$\eta = 10$

$\# \text{f. units} = \eta \times \text{Av. \#}$

$= 10 \times 6.02 \times 10^{23}$

$= 6.02 \times 10^{24}$

c) # of atoms in each f. unit of $\text{BaCl}_2 = 3$.

$\therefore \text{Total \# atoms} = 3 \times \# \text{f. units} \leftarrow \text{Common Sense?}$

$= 1.81 \times 10^{25}$

#7 a) $\eta = 10$

f. units = ?

atoms / f. unit $\text{H}_2\text{O} = 3$

$\# \text{f. units} = \eta \times \text{Av. \#}$

$= 10 \times 6.02 \times 10^{23}$

$= 6.02 \times 10^{24}$

$\# \text{atoms} = 3 \times 6.02 \times 10^{24}$

$= 1.81 \times 10^{25}$

b) $\eta_{\text{Au}} = 2.54 \text{ mol}$

atoms / atom = 1 \therefore

$\# \text{atoms} = \eta \times \text{Av. \#}$

$= 2.54 \times 6.02 \times 10^{23}$

$= 1.53 \times 10^{24}$

#7 c) $\eta = 0.00063 \text{ mol}$

atoms / f.unit = 8

atoms = ?

f.units = $\eta \times \text{Av} \#$

= $0.00063 \times 6.02 \times 10^{23}$

= 3.793×10^{20}

atoms = $8 \times 3.793 \times 10^{20}$

= 3.03×10^{21}

d) $m = 5 \text{ g}$

atoms $\text{mg/atom} = 1$;

$\eta_{\text{mg}} = \frac{m}{\text{mm}}$
 $= 5 / 24.31$
 $= 0.206$

atoms = $\eta \times \text{Av} \#$

= $0.206 \times 6.02 \times 10^{23}$

= 1.24×10^{23}

e) $m = 0.1 \text{ g}$

atoms / molecule of $\text{I}_2 = 2$

$\eta_{\text{I}_2} = \frac{m}{\text{mm}}$
 $= 0.1 / 253.8$

= 0.000394

molecules = $\eta \times \text{Av} \#$

= $0.000394 \times 6.02 \times 10^{23}$

= 2.372×10^{20}

atoms = $2 \times 2.372 \times 10^{20}$

= 4.74×10^{20}

f) $m = 3000000 \text{ g}$

atoms / molecule $\text{CH}_4 = 5$

$\eta_{\text{CH}_4} = \frac{m}{\text{mm}}$
 $= 3000000 / 16.05$
 $= 186915.9$

molecules = $\eta \times \text{Av} \#$

= $186915.9 \times 6.02 \times 10^{23}$

= 1.12×10^{29}

atoms = $5 \times 1.12 \times 10^{29}$

= 5.60×10^{29}